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Abstract

Title: Complex Adaptive Special Operations (CASO).

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Thesis: Success in future war requires Special Operations Forces (SOF) to operate as a complex adaptive system.

Discussion: This paper offers a future operating concept called Complex Adaptive Special Operations (CASO), which incorporates the intrinsically unorthodox nature of "true" special operations with complex adaptive behaviour. CASO offers a framework for enhanced understanding of the operational environment, promotes greater diversity in planning, and exploits unorthodox approaches to problems that are fundamentally "wicked." The CASO construct embraces the interactive complexity found in an operating environment through near-autonomous adaptive action that nurtures a rival system to a desired condition, or achieves its destruction through iterative systemic incapacitation.

The four components of CASO are design, planning, adaptation, and action. These four components are interconnected via multiple sensing loops that monitor the "conflict ecosystem" which in turn facilitates continuous context appropriate behaviour of the near autonomous CASO teams. Key enablers for the CASO construct include: (1) Viewing the operating environment as a "conflict ecosystem" founded on interactive complexity and non-linearity. (2) Accepting that "wicked problems" are unsolvable but can be nurtured. (3) Appreciating the evolutionary nature of "true" special operations. (4) Understanding the requirement for CASO operators to possess a highly developed intuitive capacity coupled with mental model diversity. (5) Comprehension and belief in systemic emergence characteristics. (6) Accepting that context appropriate action of near-autonomous CASO teams can be achieved through a shared operating model and a simple set of rules akin to the flocking action of birds. (7) Grasping the requirement for higher headquarters to adopt a guiding function rather than a controlling function.

Conclusion: The CASO construct views SOF operating like a virus within an ecosystem. These highly specialized interagency CASO teams immerse and survive independently within a larger system continually sensing, adapting, acting, and readapting in a near-autonomous manner to achieve local objectives. Synergized by a higher command architecture to ensure unity of purpose, the conflict ecosystem is continually manipulated to render the rival system benign.

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COMPLEX ADAPTIVE SPECIAL OPERATIONS (CASO)

Introduction

"It is not the strongest of the species that survive, nor the most intelligent, but the ones most responsive to change."

-- Charles Darwin

The current conventional approach to war is reductionist and linear. Technological innovation has emphasised the "science," rather than the "art" component of warfare, touting that wars can be won using deterministic Newtonian cause-and-effect approaches that are enforced through technologically networked centricity. This is not the case. War, like ecosystems and Al Qaeda, is a complex adaptive system. The interactive complexity that comprises such systems produces undeterminable outcomes and makes linear understanding impossible for the human mind.[1] Control of complex adaptive systems is virtually unattainable; however, they can be nurtured to a desired condition or even destroyed by manipulating the environment in a manner that exceeds their adaptive ability. Success requires an approach outside the existing paradigm – one that treats war, the operating environment, and the actors within that environment as complex adaptive systems rather than just as a structurally complex problem that can be solved in a determinable manner. To achieve this, our approach should emphasize a force that in itself is a complex adaptive system that relentlessly seeks to outpace the enemy through speed of decentralized and intuitive adaptive action. Special Operations Forces (SOF), leveraging complex adaptive systems theory, is the ideal force for such an approach.

This paper uses complex adaptive systems theory as an alternative lens through which to look at war and will explore how SOF could leverage success through complex adaptive behaviour. This paper offers a future operating concept called Complex Adaptive Special Operations (CASO), which incorporates the intrinsic unorthodox nature of "true" special operations with complex adaptive behaviour. CASO offers a framework for enhanced understanding of the operational environment, promotes greater diversity in planning, and exploits unorthodox approaches to

problems that are fundamentally "wicked." The CASO construct embraces the interactive complexity found in an operating environment through near-autonomous adaptive action that nurtures a rival system to a desired condition, or achieves its destruction through iterative systemic incapacitation.

Complex Adaptive Systems

"A system is an organized mess."[2]

The emerging interdisciplinary science of complex adaptive systems[3] provides an alternative lens to understand war and illuminates alternative approaches to counter an increasingly diffuse enemy. A system is defined as a group of independent but interrelated elements comprising a unified whole.[4] Simply stated, a complex system is interactively complex in that it is diverse and made up of multiple interconnected agents. These agents are near-autonomous decision making units that determine their own behaviour within general guidelines.[5] Complexity arises when these agents interact freely in ways that can not be anticipated. Each agent within the complex adaptive system may also be a complex system itself. The result of the interactions and relationships within the system forms an emergent characteristic, making the system greater than the simple sum of its individual parts, forming a higher order system.[6] This form of complexity can not be understood using linear or reductionist approaches to isolate causes and effects within the system since all elements are nonlinearly interconnected. It can only be understood as a whole or complete system.[7] Adaptive systems are self-organizing in that they have the capacity to learn from experience or feedback loops and survive by making internal adjustments.[8] This adaptive behaviour is based upon a vision of the future or an inbuilt operating model that facilitates decentralized control. For the purpose of this paper a complex adaptive system is concisely defined as:

> A complex adaptive system consists of many agents acting in parallel without centralized control. The non linear interactions between these agents produce adaptive and emergent behaviour. The agents organize into dynamically re-arranging non-homeostatic structures. The system builds an internal – implicit or explicit – model of the future and acts according to its internal models.[9]

Complex Adaptive War

"The primary colours are only five in number but their combinations are so infinite that one cannot visualize them all."[10]

-- Sun Tzu

The current conventional approach to war is reductionist, deterministically predicable, and linear. It is based on a Newtonian cause-and-effect planning methodology that envisages an adversary being defeated by using predictive analysis that determines specific physical centres of gravity or key nodes for destruction.[11] Technology has made warfare more structurally complex due to the number of moving parts, but this form of complexity is based on how the parts of a system interact with each other in a deterministic manner, much like an engine in a car.[12] Unlike determinable structural complexity, warfare is fundamentally an interactively complex human activity. The infinite interactions and seemingly chaotic interplay of violent human activity produces a hierarchy of individually nested, self-organized, and interrelated complex systems. Loosely coupled within an unexplainable web of intricacy these complex systems continually adapt to the dynamics of the wider global system and physical environment creating a type of "conflict ecosystem".[13] This environment can not be understood through remote linear structural analysis. Rather, understanding will only be achieved through physical interaction with the whole system and success will only be realized through adaptation from this interaction.[14]

Clausewitz has always viewed war as a complex adaptive system, as evidenced when he stated that war is "the collision of two living forces"[15] implying that war is not a mechanistic activity based on structural complexity. Therefore, not unlike Clausewitz's "remarkable trinity", complex adaptive war is a totally interactive phenomenon.[16] It is a form of armed politics, between multiple independent and interactive systems operating unconstrained within a larger global environment, using violent and non-violent means within a process of continual adaptation.[17] Complex Adaptive War is interactively complex, nonlinear, and unpredictable. It can not be understood using a Newtonian paradigm that is linear, reductionist, or cause and effect based.[18]

Complex Adaptive War is a "continuous meeting engagement"[19] that exists throughout the entire spectrum of operations – from peace to total war.[20] It acknowledges that the nature of war is immutable and that the form of war is influenced by dynamic complex adaptive variables.[21]

"Wicked" Problems

"Damned if I do, damned if I don't"

-- Anonymous

Success in complex adaptive war requires understanding of systems thinking and the ability to see wholes that result from interactive complexity – "seeing interrelationships…and processes of change rather than snapshots."[22] Without a systems thinking approach, military problem solving is largely based upon a linear cause-and-effect construct. This approach maybe suitable for problems that are "tame" in nature. That is, problems that lend themselves to predictive analysis resulting in an identifiable resolution to the problem. Unfortunately, without understanding the impact on the complete system as a whole, this type of linear problem solving may lead to graver consequences. A simple example is the conduct of a direct action to kill an insurgent leader. Without understanding the wider interactions of the insurgent system, killing the insurgent leader may create adverse effects on the population that you are trying to win the support of, thus creating more insurgents within an increasingly hostile population. However, if the insurgent leader is not killed he will continue to recruit insurgents. This situation creates a problem that is fundamentally "wicked" in nature.[23]

"Wicked" problems occur when solving the immediate problem results in the creation of dilemmas which are just as bad as the original problem, or indeed worse, due to immense interactive complexity. Every wicked problem can be considered a symptom of another problem. They lack definition and possess no right or wrong solution, only a "good enough" answer due to its unsolvable nature. The consequence of actions can not be predetermined because of the dynamic interactive complexity, thus the repercussions of actions can only be understood by continual

observation or sensing of the system as a whole. This sensing then enables further action, possibly using alternate approaches, to continually push or nurture the problem towards a suitable condition. All wicked problems are unique; therefore, templated solutions will rarely produce resolution, necessitating the requirement for adaptive or unorthodox approaches.

Special Operations Forces

"Simply defined, Special Operations Forces are what conventional forces are not." [24]

Field Marshall Slim, at the conclusion of the Burma Campaign during the Second World War when reflecting on his experiences with Wingate's Brigade sized Special Force – the Chindits – "came firmly to the conclusion that such formations, trained, equipped, and mentally adjusted for one kind of operation, were wasteful." [25] However, he firmly believed in the need for "one kind of special unit…designed to be employed in small parties, usually behind the enemy, on tasks beyond the normal scope of warfare." He felt that such a unit would require troops with "many qualities and skills not expected of the ordinary soldier and they will use many methods beyond his capacity." He believed that such a unit would "not [be] costly in manpower [and] if handled with imaginative ruthlessness, achieve strategic results." [26] In essence, Slim has identified the duality of SOF and the often emotional debate about what "special" really means.

As the current core tasks of special operations become increasingly accepted as the norm, [27] contemporary special operations are becoming less "special" and could arguably be more appropriately characterised as "conventional elite." Theoretically, if a method of operation has an agreed or shared meaning, it is conventional. [28] Therefore, even the term unconventional warfare, which has an official Department of Defence definition, arguably makes unconventional warfare conventional. [29] In effect, special operations are being continually superseded by a military evolutionary process that requires once uniquely special skills, approaches, and equipment to be handed off as conventional forces adopt them. [30] To reinforce this issue, during World War II when the term "special operation" formally entered the modern military lexicon, organisations such as the

Special Operations Executive and men like Otto Skorzeny were actually conducting operations that were "special".[31] At the time, the full scope of their operations was not defined; hence, they were "special operations" or more appropriately unorthodox operations. Military evolution and formalised doctrine has made these original special operations conventional. Figure 1 shows graphically the evolutionary process of special operations.
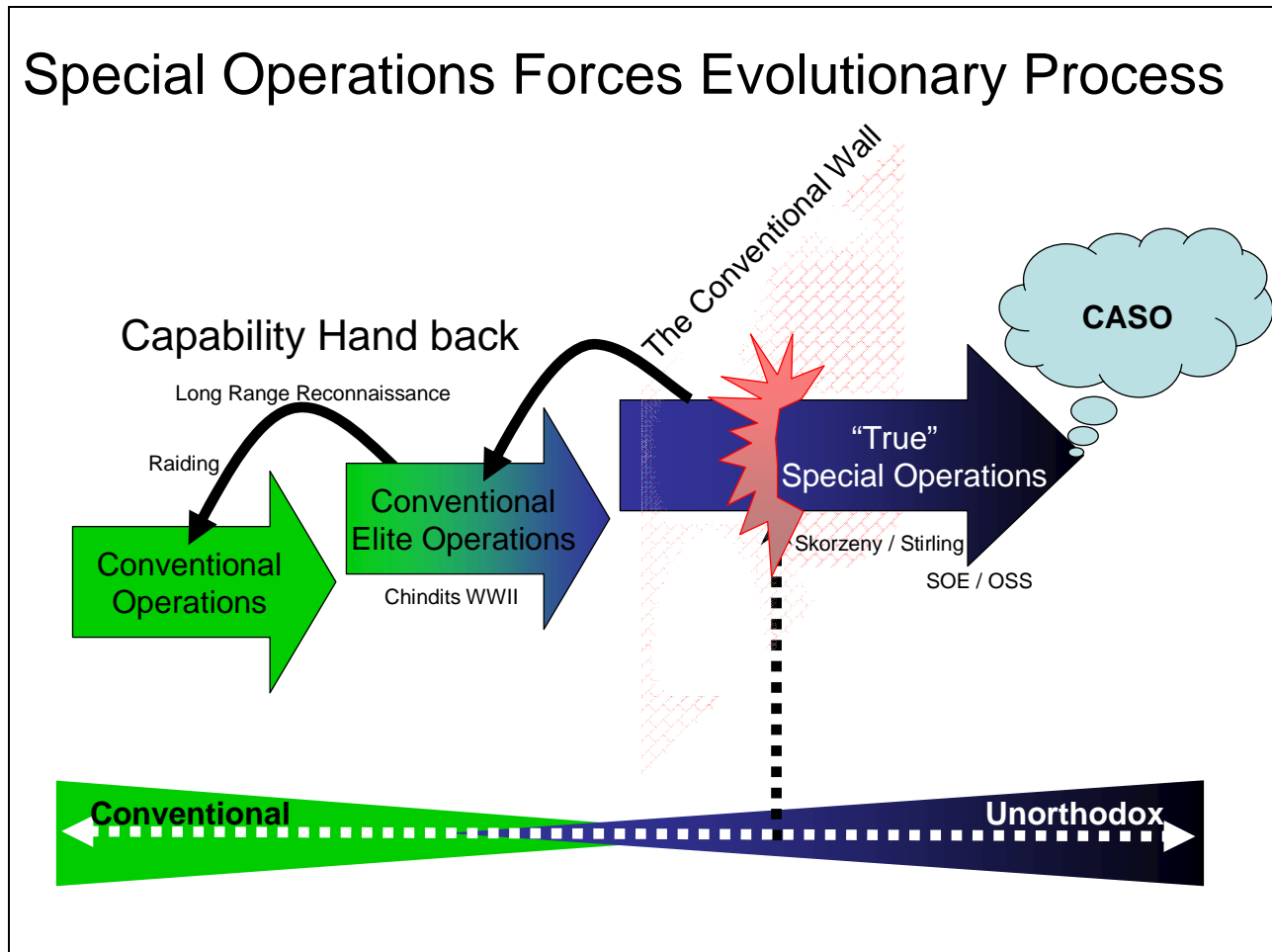
Figure 1

Typically, contemporary special operations comprise two types of activities. Firstly, they conduct tasks that others conduct but exceed their range and capability.[32] These tasks are conducted by designated conventional elite who are organised, equipped and trained to provide a response to pre-framed missions such as direct action, long range penetration, and unconventional warfare. While these forces require specially selected personnel, specialised training and equipment; their

approach is not unorthodox. They conduct contemporary missions that are well defined. In today's environment these forces are special by name, rather than by tasking or attribute. However, these forces do provide the essential "gene pool" and informative training environment essential for the future recruitment and selection of personnel suited to conduct unorthodox activities.

The second type of activity involves conducting tasks that no other forces conduct;[33] hence, these can be considered unorthodox or "true" special operations. Unfortunately, these activities and the forces that conduct such activities are problematic when viewed in a conventional construct. Their tasks defy description because a specific requirement does not exist until a need arises in the future. Because there is no existing task, force structure, training and equipment can not possibly be designed until the task becomes apparent. A historical example is OPERATION KINGPIN: The U.S. Army raid on Son Tay, 21 November 1970, tasked to rescue American prisoners of war in North Vietnam. At the time there was no existing conventional requirement for long range helicopter recovery operations and no existing force structure or collective training for the task. This operation can be considered "truly" special. However, today there are forces and force structure assigned to conduct such operations, thus now making it a conventional elite task. Fundamentally, "true" special operations are conducted by specially selected and trained personnel, creating disproportionate effects in relation to their size, to solve operational and strategic level problems through *unorthodox adaptive* action.

Complex Adaptive Special Operations

"Agitate him and ascertain the pattern of his movement"[34]

-- Sun Tzu

CASO is an operating concept that seeks to leverage success through near autonomous complex adaptive behaviour that enables "true" special operations teams to spontaneously cooperate in a coordinated and concerted manner. CASO teams are adaptive in that they seek advantage by being capable of automatic internal adjustment in response to external environmental

dynamics or by proactively adjusting so they can influence the external environment.[35] This enables

the utilization of unorthodox approaches to unique situations or situations that require solutions for

which there is no existing conventional response. Furthermore, they exhibit internal interactive

complexity by possessing the capacity to contain a large number of forms or functions – emergence

properties.[36] This is achieved by tailoring a team of specially selected personnel, each possessing

unique military and non military expertise, to solve problems that are inherently wicked in nature.

Moreover, CASO teams are capable of near-autonomous decision making that facilitates continuous

adaptive behaviour based on a shared inbuilt operating model and the feedback it receives from an

adversary system or the external environment. It is this particular quality that outstrips conventional

centralized command and control mechanisms. In simple terms this is an operating construct that

views SOF operating like a virus within an ecosystem, achieving deep penetration through

decentralized adaptive action to keep an adversary system in a state of bounded instability until a

desirable end state is achieved.

CASO comprises four main components that operate using multiple interconnected sensing

loops, similar to Boyd's OODA Loop – Observe, Orient, Decide, and Act.[37] However, unlike the

OODA Loop, which is primarily a decision cycle that generates speed of action, CASO is a

decentralized adaptation system that produces immediate "context appropriate behaviour."[38] CASO

generates faster action because it is not impeded by an organizational command and control

superstructure designed to support a centralized decision making process. The four components of

CASO are design, planning, adaptation, and action. These four components are interconnected via

multiple sensing loops that monitor the "conflict ecosystem" that is resultant from the complex

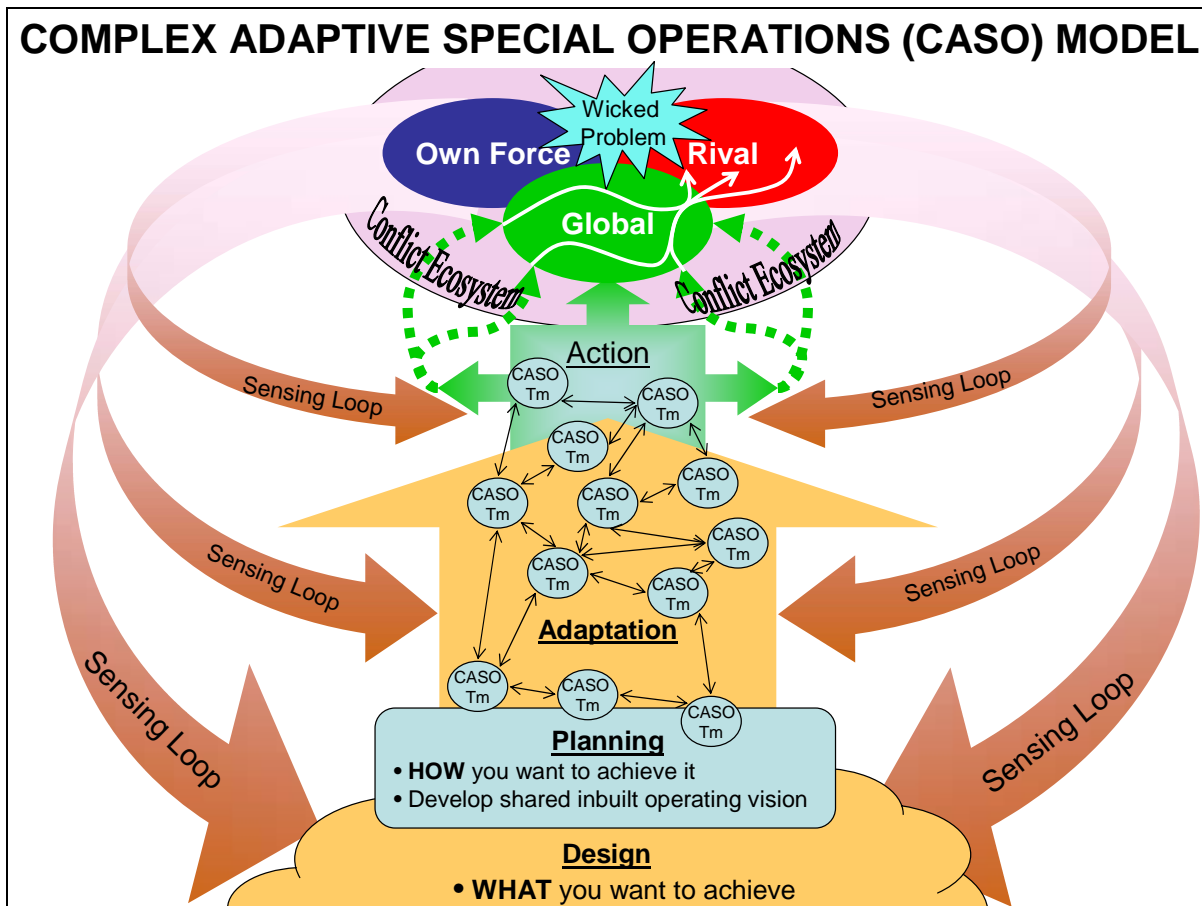adaptive war operating environment. Figure 2 shows the basic CASO Model.

COMPLEX ADAPTIVE SPECIAL OPERATIONS (CASO) MODEL

Figure 2

Design. Clausewitz states that "in war more than any other subject…the part and the whole must always be thought of together."[39] Design is about defining the complex adaptive war environment and "problem setting" using a systems thinking approach – seeing wholes. The systemic approach identifies interrelationships and patterns of change rather than static snapshots or linear cause-effect chains.[40] The aim is not to identify individual components of the rival structure for cumulative destruction. Rather, to understand what interrelationships may be impacted upon in order to cause incapacitation resultant from an inability to function as a cohesive whole.[41] Due to the countless variables generated by interactive complexity, complete understanding will never be possible. However, by considering the complex adaptive war environment as a "conflict ecosystem", a general approach can be designed. This is an iterative process that considers the

interactions between own force complexity, rival force complexity, and global complexity within a larger external environment.

Own force complexity relates to the interactive complexity that exists within our own force structure. An understanding of our own systemic environment highlights areas of potential friction such as interactions between services, government agencies, and coalition partners. Conversely, it also highlights potential strength that is derived from synchronising interrelationships as a unified whole. Rival force complexity is assessed in a similar manner; although, understanding of the rival system will take the form of a hypothesis due to an inherent lack of knowledge regarding its structural complexity and more importantly its interactive complexity. Deeper understanding will only come from interaction with the rival system to test or confirm understanding. Global complexity refers to the external relationships that impact on both own force and rival systems. The interactive complexity generated by culture, religion, politics, social infrastructure, and globalization provide avenues for deep penetration in order to impact a rival system or to strengthen an own force system. It is important to acknowledge that the global system is truly transnational and its influence is borderless. This environment provides the greatest avenue for future unorthodox approaches.

When these three environments are considered together they bound the complex adaptive war environment as an ecosystem. It facilitates greater understanding and enables us to identify patterns and relationships, which is particularly important in the case of wicked problems when the third and fourth order effects must be anticipated. Viewing the operational environment using this non-linear methodology exposes a wider gambit of unorthodox approaches, particularly in the global environment, for CASO teams to exploit. Al Qaeda and other transnational terrorist organizations are already exploiting this unbounded environment while conventional military approaches continue to operate within simplistic artificially bounded areas of operations. By using a

nonlinear lens to understand the operating environment, the design component of CASO defines the problem and determines *what* you want to achieve.[42] Figure 3 shows the complex adaptive war operating environment and potential CASO avenues of exploitation. The white arrows depict possible unorthodox pathways, avoiding the conventional clash, to achieve deep penetration of a rival system via the global realm.[43]
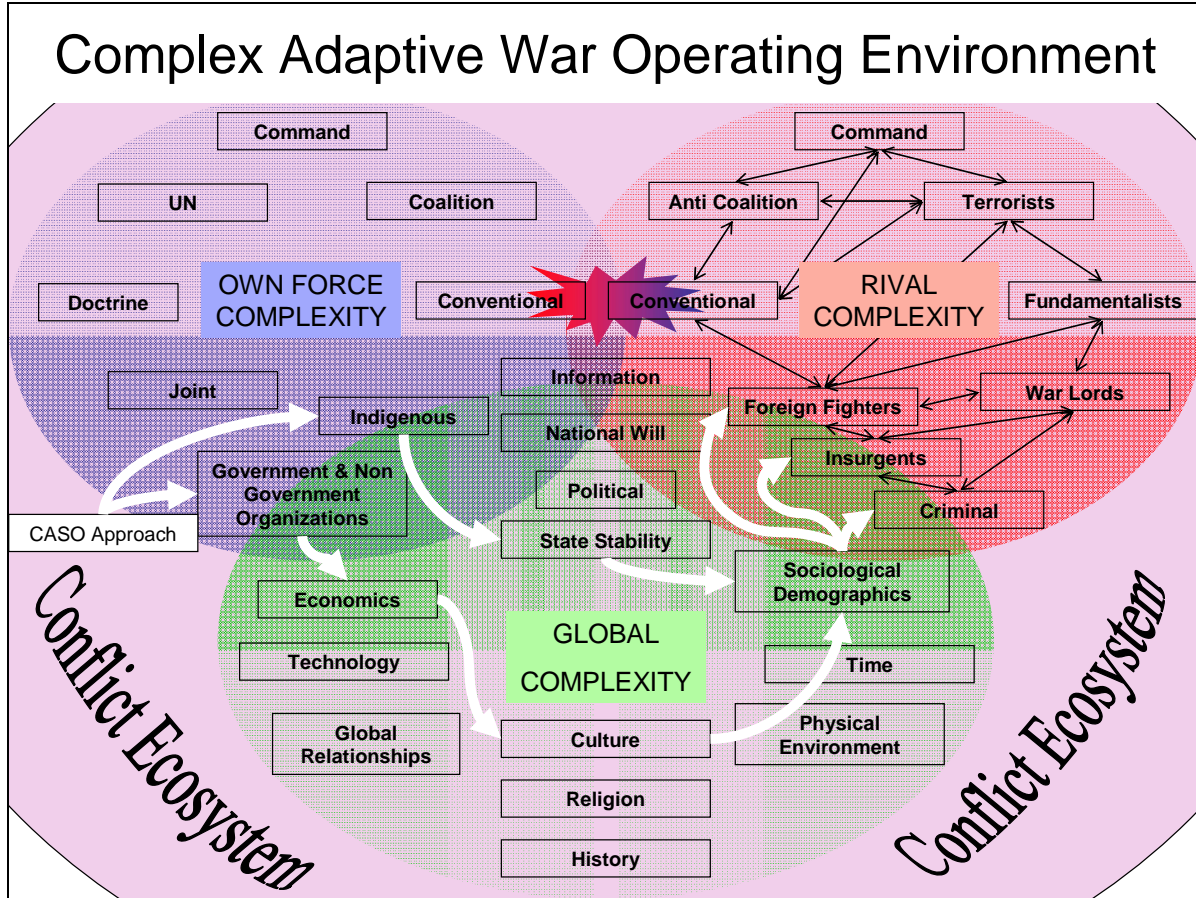

Figure 3

Planning. Once the operating environment and problem has been sufficiently defined and a design for what is to be achieved is determined, planning can commence. "Planning is the art and science of envisioning a desired future and laying out effective ways of bringing it about."[44] Planning is *how* you are going to achieve your design using a process of iterative refinement that produces a solidly workable plan. "Aiming for perfection too early can result in over commitment, exhaustion, and disaster." The aim is to make "small improvements and continual adjustments" [45]

by testing the plan through discrete interaction with the rival system. This interaction is sensed or observed and acts as feedback to further refine the plan as the multitude of unknowns slowly become known. The overall intent is to "hasten slowly"[46] in order to yield greater results within a shorter time frame and to unmask unorthodox approaches to impact the rival system.

CASO planning relies heavily on the diversity of the planners' intuition and mental models. Without this diversity it is unlikely that innovative approaches will be discovered. Plans will be bounded by conventional elite solutions that lack creativity or uniqueness. Intuition is the "ability to use experience to recognize situations and know how to handle them." Intuition is not an inborn trait; rather, it is developed by expanding an individual's experience base.[47] Mental models shape how people act, affect what people see, and therefore what they do. Incomplete or incorrect mental models will impact planning adversely by inhibiting the diversity of approaches to a problem.[48] Clausewitz confirmed this view when he stated "no activity of the human mind is possible without a certain stock of ideas; for the most part these are not innate but acquired."[49] Humans are the products of their education or training; hence a military trained person will be more likely to produce conventional military solutions. This is an impediment to CASO where unorthodox approaches need to be considered.

For CASO teams to be capable of operating within a complex adaptive war construct, particularly within the global realm, intuition and mental model diversity is essential. Diversity is achieved by selecting individuals with unique character traits usually derived from informative life experience. While SOF selection generally draws from across all armed services it must also recruit from other government agencies and potentially from non-government organizations. Once a base level of SOF competency has been achieved by individual operators, a second form of selection would identify personnel suitable for CASO. The challenge is to capture the essential martial qualities of SOF while developing intuitive skills that enable a variety of situations to be assessed

quickly and accurately regardless of the operating environment. To achieve this, CASO operators

must spend time outside of the military environment. This time would be used to develop cognitive

task analysis – identifying the critical cues, patterns, and skills for particular environments[50] –

within government organizations and potentially the commercial sector. This process of intuitive

development concurrently builds diversity in a CASO planner's or operator's mental model

allowing them to identify alternative avenues of approach and methods of operation that could have

remained concealed to the bounded military trained mind.

The net result of CASO planning is the development of a shared internal mental model of a

possible future that enables a CASO team, or multiple CASO teams, to act in parallel without

centralized control. This mental model acts as a shared inbuilt operating vision enabling CASO

teams to self-organize and contribute to the overall objective while concomitantly maintaining near-

autonomous adaptive creativity. It also acts as the standard for CASO team behaviour, as the goal

for action, and facilitates freewheeling adaptive behaviour as a situation or the environment

changes.[51] This is further enhanced through loose coupling of the plan, in that the plan is not based

on specific predictive analysis. Loosely coupling the plan enables the CASO teams to have a degree

of resilience through built in buffers at critical junctures in the plan, facilitating a greater freedom of

response. This ultimately limits the effects of shock to the own force system but increases

complexity for a rival system by developing undeterminable uncertainty and confusion.[52] A tightly

coupled plan, founded on centralised control and predicted outcomes, will have the opposite effect

by creating friction within our system when things do not go as planned.

Adaptation. CASO teams that are able to adapt and self-organize spontaneously in a

coordinated manner, regardless of environmental dynamics, to better achieve local objectives will

out perform centrally controlled teams designed for a singular purpose. This is because they have a

greater ability to change form as the situation dictates, thus making it more effective in a complex

adaptive war operating environment. As each operating environment is unique, each CASO team must be tailored towards the peculiarities of the specific environment – language, ethnicity, technical expertise, and specialist knowledge. This is more than simple task organisation as the sum of the CASO team needs to be greater than its parts in order to create emergence properties – higher order system – and to facilitate adaptive behaviour when the environment changes. Therefore, the CASO team is not only structured based on the current understanding of the operational environment but on potential future forms of the operational environment. The basic CASO team works beyond the conventional elite level, with their central focus being unorthodox adaptability and not highly honed specific skill sets. Through intuitive development, mental model diversity, and generic skill tailoring the CASO team possesses the necessary adaptive properties to survive with protracted endurance despite situational changes.

In response to a dynamic environment the CASO team adapts demonstrating emergent behaviour in order to achieve local objectives. A simple set of rules or attractors, derived from CASO planning, are used to govern these actions. These rules produce behaviour that is similar to the flocking actions of birds – creating complex motion without the need to communicate. Bird flocking is based the three rules of separation, alignment, and cohesion.[53] CASO teams would also employ tailored rule sets using possible attractors that relate to mission exposure, use of force, and cohesion.[54] Such attractors enable spontaneous cooperation and self-organization with other CASO teams in order to achieve local objectives. The selection of these attractors during the planning component is critical in that they bound adaptive action but also enable adaptive behaviour.

Action. CASO is fundamentally about interaction with a rival system and is therefore about adaptive action. This action occurs continuously throughout the CASO model. During design and planning it is generally in the form of probing actions that impact with the rival system to produce feedback. This feedback is observed or sensed to develop greater systemic understanding and is an

input for iterative refinement for planning. Sensing action is the passive internal and external observation of the operational environment. It is a continuous activity that senses the interrelationships and patterns of change of the rival system in order to prompt further CASO adaptive action. Preparatory action is based on operational preparation of the operating environment. It identifies potential unorthodox approaches, tests viability, and prepares or sets the conditions for decisive CASO action. Once sufficient understanding of the rival system has been achieved, CASO teams then conduct decisive action to create systemic incapacitation or to nurture the rival system to adapt in a manner that is desirable. As a result of the CASO decisive action a change in the operating environment will occur. This change is sensed, prompting CASO adaptation or self-organisation locally and further informs the design and planning process. Further decisive action may continue in the form of reinforcing action or modifying action depending upon the adaptation of the rival.[55] This is particularly necessary when considering wicked problems.

CASO action is based on decentralized control and is counterintuitive to the current practical application of hierarchical command and control; which is gravitating towards technologically networked centricity to maintain positive and direct control over a subordinate's actions. If the natural condition of complex adaptive war is chaos, then attempting to maintain control is like forcing two positive ends of a magnet together increasing internal friction. CASO relies on near autonomous freedom of action with minimalist control, thus reducing friction by operating in harmony with the natural condition of complex adaptive war.[56] The role of the higher headquarters in CASO is focused on more of a guiding action vice controlling action. This is akin to guiding and sequencing a campaign plan towards achieving a strategic goal. Headquarter actions would include synthesizing continuous design and planning, policing the inbuilt operating model – altering CASO counterproductive behavior – and synchronizing the overarching CASO team employment based on a broader understanding. The CASO teams are left to adapt and self-organize

near-autonomously in order to achieve local objectives. This requires a unique type of command and leadership where "the leader is simply the first among equals…everybody depends on everybody else."[57] Finally, the CASO construct negates the need for frequent contact with the headquarters. This greatly mitigates the risk of strategic compromise or detection. Using the shared operating model and overt information mediums CASO teams are able orient their actions.[58] This is evidenced by the difficulty in detecting the elementary nature of Al Qaeda command and control architecture.

Conclusion

"In practical terms this means we must not strive for certainty before we act for in doing so we will surrender the initiative and pass up opportunities"[59]

By continuing to see warfare in determinable, linear, and mechanistic manner, military operations will produce wicked problems resulting in attritional battles of national exhaustion. Rapid victory may be achieved initially, but long term stability will not be achieved unless interactive complexity is fully appreciated from beginning to end. Clausewitz stated that "in war the result is never final."[60] In essence, the rival system will always adapt unless its operating environment and the relationships that feed the rival system are impacted upon to cause extinction or a nurtured condition. The CASO construct views SOF operating like a virus within an ecosystem. These highly specialized interagency CASO teams immerse for extended duration and survive independently within a larger system continually sensing, adapting, acting, and readapting in a near-autonomous manner to achieve local objectives. Synergized by a higher command architecture to ensure unity of purpose, the conflict ecosystem is continually manipulated to render the rival system benign. The CASO construct offers enhanced understanding of the operating environment through holistic design, greater diversity in planning, and exposes unorthodox approaches that would not be apparent to the conventionally trained military mind. Moreover, it produces speed of context appropriate action that outstrips conventional speed of decision through near-autonomous action.

While this aspect is potentially at odds with hierarchically orientated commanders, it is potentially the only way a diffuse non-conventional rival will be defeated. With changes in SOF selection, personnel development, structure, and operating philosophy; the transnational environment that Al Qaeda resides will become increasing inhospitable.

Notes

[1] Bennet, Alex and David. *Organizational Survival in the New World: The Intelligent Complex Adaptive System* (Burlington, MA: KMCI Press, 2004), 295.

[2] Clay, Peter and Austin, Warwick. *Another Way of Thinking: A Discussion paper on Systemic Design* (Canberra: Chief of the Australian Army Exercise Reading Package, November, 2006), 39.

[3] The term complex adaptive system was coined at the interdisciplinary Santa Fe Institute, established in 1984, by John H. Holland. The institute was founded with the belief that an understanding of complex adaptive systems is critical to addressing key environmental, technological, biological, economic, and political challenges. Morowitz, Harold J. and Singer Jerome L. *The Mind, The Brain, and Complex Adaptive Systems* (Reading: Addison-Wesley Publishing Company, 1995).

[4] Kilcullen, David. *Irregular Warfare: A systems Assessment* (Canberra: Australian Army Headquarters, September 2004), 5.

[5] Bennet, 290.

[6] Emergence results from interactions and relationships among its people (agents) and the environment resulting in stable patterns within the system of undeterminable outcomes such as morale, culture, and emotion. Bennet, 290. Ant mounds are an example of emergence in the natural world. Their size and shape is undeterminable until its form is completed.

[7] Schmitt J.F. "Command and (out of) Control: The Military Implications of Complexity Theory" in *Complexity, Global Politics and National Security*, (Washington: National Defense University, 1997), 224.

[8] Bennet, 290-291.

[9] There is no formally agreed definition of what a complex adaptive system is as it is an emerging science. Holland, John and Murray Gell-Mann, from the Santa Fe Institute first coined the term in 1984 and their definition is the most readily accepted. Cited in Wellbrink, Joerg., Zyda, Mike., and Hiles, John., *Modeling Vigilance Performance as a Complex Adaptive System* (JDMS, Vol.1, Issue 1, The Society for Modeling and Simulation International, April 2004), 30.

[10] Sun Tzu. *The Art of War*, Translated and with an Introduction by Samuel B. Griffith (London: Oxford University Press, 1963), 91.

[11] Dr Joe Strange defines the Center of Gravity (COG) as "Primary sources of moral or physical strength, power and resistance." His predictive analysis is derived from the COG that in turn determines Critical Capabilities (CC), Critical Requirements (CR), Critical Vulnerabilities (CV), which leads to "decisive results" if attacked. A complete explanation is contained within, *Centers of Gravity & Critical Vulnerabilities: Building on the Clausewitzian Foundation So That We Can All Speak the Same Language* (Quantico: Marine Corps University, Perspectives on Warfighting, Number Four, Second Edition, 2002), 43. Col John A. Warden III, USAF, *Air Theory for the 21st Century*, http://www.airpower.maxwell.af.mil/airchronicles/battle/chp4.html, accessed 19 February 2007, contends a structural systems approach based on attacking five key nodes – Leadership, systems essentials, infrastructure, population, fielded military.

[12] Schmitt, 224.

[13] Kilcullen, *Counterinsurgency Redux*, (Survival: vol 48, no 4, winter 2006-07), 122.

[14] Australian Army. *Adaptive Campaigning: The Land Force Integrated Response to Complex Warfighting, Version 4.15* (Canberra: Directorate Combat Development Future Land Warfare, 3 November 2006), 6-7.

[15] Clausewitz, Carl Von, *On War* (Princeton, NJ: Princeton University press, 1984), 77.

[16] Clausewitz's trinity is "composed of primordial violence, hatred, and enmity, which are regarded as a blind natural force; of the play of chance and probability within which the creative spirit is free to roam; and of its element of subordination, as an instrument of policy, which makes it subject to reason alone." – War is the interplay between the people, the government, and the military. Clausewitz, 89.

[17] Australian Army, *Adaptive Campaigning*, 2.

[18] Schmitt, 222.

[19] Australian Army, *Adaptive Campaigning*, 7.

[20] The spectrum of operations is defined as a total phenomenon and does not sub-categorize war into peace, military operations other than war and war; rather it views war in accordance with Clausewitz's remarkable trinity – the continuous interaction between the people, government, and the military.

[21] The enduring features of war include: friction, danger, and uncertainty; influenced by the variables of human interaction, the physical domain, innovation, and chance. Australian Army, *Land Warfare Doctrine 1: The Fundamentals of Land Warfare*, (Puckapunyal: Land Warfare and Development Centre, 2002), 35-37.

[22] Senge, Peter M., The Fifth Discipline: The Art & Practice of the Learning Organization (New York: Doubleday, 1990), 73.

[23] Rittel, H. W., and Webber, M. M. *Dilemmas in a General Theory of Planning* (Amsterdam: Elsevier Publishing Company, 1973), 169. Rittel and Webber are the original pioneers of the tame and wicked problem concept.

[24] Lamb, Christopher J. *Perspectives on Emerging SOF Roles and Missions: The view from the Office of the Secretary off Defense* in Shultz, Jr. Richard H., Pfaltzgraff, Jr. Robert L., Stock Bradley W. *Roles and Missions of SOF in the Aftermath of the Cold War* (unknown publisher, 1995), 200.

[25] Slim, Field Marshal Sir William. *Defeat into Victory: The Magnificent Account of a Great Campaign of the Second World War* (New York: David McKay Company, Inc, 1961), 455-456.

[26] Slim, 457.

[27] The current core tasks of US Special Operations include: direct action, special reconnaissance, foreign internal defense, unconventional warfare, counterterrorism, counter-proliferation of weapons of mass destruction, civil affairs, psychological operations, and information operations. Joint Staff. *Joint Publication 3-05, Doctrine for Joint Special Operations* (Washington: Joint Chiefs of Staff, 17 December 2003), II-3 – II-4.

[28] Conventional is defined as not spontaneous or sincere or original, having agreed meaning. Australian Pocket Oxford Dictionary, Second Edition (Melbourne: Oxford University Press, 1986), 152.

[29] Unconventional Warfare — A broad spectrum of military and paramilitary operations, normally of long duration, predominantly conducted through, with, or by indigenous or surrogate forces who are organized, trained, equipped, supported, and directed in varying degrees by an external source. It includes, but is not limited to, guerrilla warfare, subversion, sabotage, intelligence activities, and unconventional assisted recovery. Joint Staff, Joint Pub 3-05, II3.

[30] For example: special operations were the first to use night vision technology, now every modern western solider operates with night fighting equipment. Counter terrorism and urban assault operations, once the sole domain of special operations, are now routinely conducted by police tactical response and infantry units in Iraq and Afghanistan.

[31] Obersturmbannfuher Otto Skorzeny of the German Waffen-SS and his counterpart Colonel Sir David Stirling, founder of the British Special Air Service, are both considered among the founding fathers of modern day Special Operations Forces. Skorzeny was labeled as the most dangerous man in Europe following his successful special operation to rescue Benito Mussolini and his false flag operations during the battle of the Bulge. The Special Operations Executive (SOE) and the Office of Strategic Services (OSS) were Allied organization designed to conduct warfare by means other than direct military engagement. Their operations generally achieved strategic and operational effects, employed unorthodox approaches, conducted by specially selected personnel, requiring training and equipment that is not conventional.

[32] Joint Staff, Joint Pub 3-05, II-3.

[33] Joint Staff, Joint Pub 3-05, II-3.

[34] Sun Tzu, 100.

[35] Bennet, 290.

[36] Bennet, 290. See note 7 for the definition of emergence.

[37] Where the OODA Loop aims to "enable a commander to compress time" through speed of decision, CASO aims to decentralize the decision process creating intuitive action that outpaces the decision process based on a shared mental operating vision. Coram, Robert. *Boyd: The Fighter Pilot Who Changed the Art of War* (Boston: Little, Brown and Company, 2002) 334 – 344.

[38] Australian Army, *Adaptive Campaigning*, 8.

[39] Clausewitz, 75.

[40] Senge, Peter M. *The Fifth Discipline: The Art & Practice of the Learning Organization* (New York: Doubleday, 1990) 68 - 73.

[41] U.S. Marine Corps. *Warfighting*, Marine Corps Doctrinal Publication 1 (Washington: Department of the Navy, 1997), 37.

[42] Dr Bradley Meyer. U.S. Marine Corps, School of Advanced Warfighting on 21 November 2006, during a planning session de-brief, defined design as what you want to do and planning as how you want to do it.

[43] Conventional military planners generally only see a direct contest between a red and a blue force. The CASO approach is based on exploiting interactive complexity; for example, utilizing the global realm to penetrate a rival system via government or non government front organisations to gain access to the local economy. Deep penetration is achieved by further exploiting local cultural practices to infiltrate societal demographics in order to gain access to the recruitment pool for criminals, insurgents, and foreign fighters for the purpose of undermining rival capabilities.

[44] U.S. Marine Corps. *Planning*, Marine Corps Doctrinal Publication 5 (Washington: Department of the Navy, 1997), 37.

[45] Justice Little. *Outstanding Investments: Weekly Updates* (OI@agorafinancial.com: 31 August and 5 September 2006).

[46] "Hasten Slowly" is the motto of the Australian Special Operations Command. Through solid, persistent, and patient planning greater results will be achieved quicker as opposed to simply leaping in blind and full of aimless vigour.

[47] Klein, Gary. *Sources of Power: How People Make Decisions* (Massachusetts: The MIT Press, 1998), 42-43.

[48] Klein, 152-153.

[49] Clausewitz, 145.

[50] Klein, 169.

[51] Bennet, 62-63.

[52] Kuruc, Anton. *The Relevance of Chaos Theory to Operations* (Australian Defence Force Journal No 162 September / October 2003), 10.

[53] Bird flocking rules are based on: separation – avoid crowding neighbours; alignment – steer towards average heading of neighbours; and cohesion – steer towards average position of neighbours. Wikipedia, Flocking Behavoir, http://en.wikipedia.org/wiki/flocking_%28behavior%29, accessed 2 December 2006.

[54] Possible CASO rules may include: exposure – don't get compromised; force – use of deadly force, and cohesion – proximity to other CASO elements.

[55] Australian Army, *Adaptive Campaigning*, 8-9.

[56] Schmitt, 225.

[57] Jonas, George. Vengeance: The True Story of an Israeli Counter-Terrorist Team (New York: Simon & Schuster, 2005), 105.

[58] The Mossad team tasked to avenge the massacre of 11 Israeli athletes at the Munich Olympics in 1972 operated using a small, self-contained group which operated for an unspecified duration – until the job was completed. The team was told not to communicate with the headquarters; rather progress reports would be passed using newspaper headlines. For a fuller description see Jonas, 92.

[59] U.S. Marine Corps. *Warfighting*, 81.

[60] Clausewitz, 80.

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